



Short report

Improving traditional dental autopsies in postmortem examinations of intraoral gunshot wounds



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ABSTRACT

Despite the recent advances in the post-mortem forensic examinations, some medico-legal institutes are limited in accessing improved technological facilities, hampering an optimal autopsy. Specifically in developing countries, high-cost imaging devices are not afforded, making necessary the development of alternative autopsy techniques. In parallel, in dental autopsies muscle stiffness is often observed lacking mouth opening. This situation is specifically worse in cases of intraoral firearm injuries, in which detailed description of the detected wounds must be reported post-mortem. Based on this context, the present study aims to illustrate two cases of intraoral firearm injuries, in which the dental autopsies were performed considering a conservative and alternative technique for the improvement of mouth opening. Both cases provided optimal results, indicating the new approach as a valuable tool for dental autopsies.

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1. Introduction

In the last decade virtual autopsy emerged as an efficient forensic tool for conservative cadaveric examinations.^{1–3} However, developing countries are limited in accessing high-tech imaging devices due to its expensive costs.⁴ In parallel, hampered mouth opening is one of the most common findings detected during dental autopsies. Specifically, in cases of intraoral firearm injuries, detected wounds must be reported in detailed description during post-mortem (PM) exams, making necessary a proper view of the oral cavity. In addition, legal request for preservation of the facial traits of the victim is also considered a limiting factor for the assessment of the oral cavity. In this context, jaw resections and surgical flaps of soft tissue⁵ are not considered, making necessary the development of alternative and more conservative techniques for an adequate registration of intraoral findings. Moreover, dentists should never perform post-mortem surgical techniques without the consent of the related medico-legal official, turning the amount of surgical approaches restricted but still important in the forensic environment. The present study aims to propose an alternative and more conservative

technique for the improvement of mouth opening, illustrating two cases of PM examinations of intraoral firearm injuries.

2. Materials and methods

The present technique consists of performing bilateral “C-shaped” incisions in the retromandibular region. The upper limit of each incision is placed one centimeter below the ear lobe. Yet the lower limit is determined by considering a virtual vertical projection following the anterior border of the mandibular ramus. The incision must follow the posterior border of the mandible from a minimum distance of two centimeters (Fig. 1). The total length of each incision is approximately 6 cm in adults.

Once the incisions are bilaterally performed, deep layers of the Medial Pterygoid and Masseter muscles and respective tendon insertions must be dissected around the mandible angle. Further on, linear osteotomy is performed separating the mandible ramus to the mandible body. Finally, discrete intervention is expected (Fig. 2).

3. Results

3.1. Performing the technique

Case 1 – A 50-year-old man was PM radiographically examined, revealing a firearm projectile inside the skull. Muscle rigidity

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Fig. 1. “C-shaped” incision in the retromandibular area. A–B distance indicates a minimum 2 cm between the incision and the posterior limit of the mandible. The vertical line indicates the anterior limit of the mandibular ramus as the inferior limit of the “C-shaped” incision.

limited the mouth opening and hampered the dental autopsy. The proposed technique was performed, providing a clinical mouth opening range of 45 mm, allowing for a proper visual examination (Fig. 3).

Case 2 – An unknown human body, compatible to a 25 year-old man was referred for autopsy in the Forensic Medical Center.

Conventional radiographic examination revealed a firearm projectile inside the victim's skull. Once more, the body presented muscle rigidity with lack of mouth opening, hampering the dental autopsy. After performing the proposed alternative technique, the mouth opening was measured revealing a space of approximately 30 mm between the jaws. The technique allowed for a proper oral examination, enabling an overview of the complete dental arches (Fig. 4).

In both situations the legal request for preservation of the victims' facial traits was present due to family issues, justifying the performance of the proposed technique. Moreover, medico-legal officials allowed for the performance of the proposed technique in both cases.

4. Discussion

In the last years forensic imaging is pointed out as the best approach for the PM investigation of firearm victims.⁶ By performing imaging examinations previous to the traditional autopsy, the medical examiner obtains the exact location and the potential trajectory of the projectile in forehand.^{7,8} On the other hand, virtual autopsy facilities may not be available in the forensic routine, making essential the development of alternative techniques.

However, alternative techniques of non-radiographic source are not always conservative. Considering the lack of PM mouth

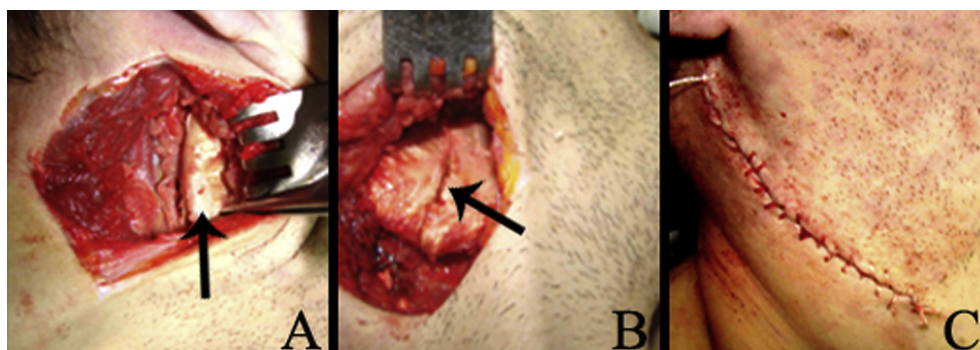


Fig. 2. Clinical view of the proposed technique. A: dissection of the retromandibular area, exposing the mandible angle (arrow); B: oblique osteotomy in the mandible angle (arrow); C: discrete signs of intervention after the surgical approach.

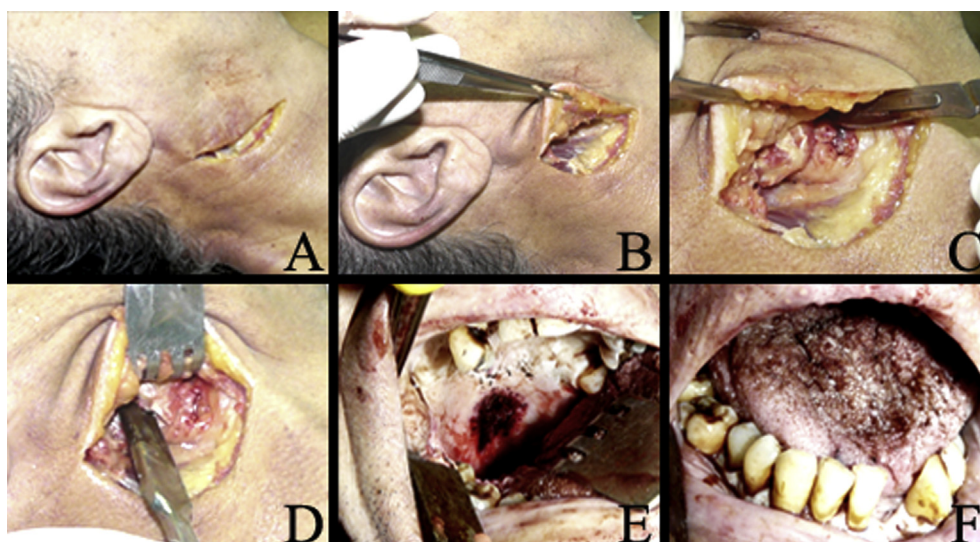


Fig. 3. Case #1. A: “C-shaped incision”; B: retromandibular dissection; C: myotomy; D: osteotomy; E: improved intraoral visualization, enabling to detect the abrasion ring, soot, gunpowder and tattooing; F: optimal visualization of the lower dental arch.



Fig. 4. Case #2. A: lateral view of the improved mouth opening after the proposed technique; B: frontal view of the mouth opening, revealing an opening range of approximately 30 mm; C: occlusal view of the upper dental arch; D: occlusal view of the lower dental arch.

opening, in 1974, Luntz and Luntz⁹ presented a technique based on “V-shaped” incisions, extending from the labial commissure of the mouth to the auricular region, enabling the visualization of the vestibular and buccal surfaces of the teeth, or even further jaw resections. Similarly, Kieser-Nielsen,¹⁰ in 1980, describe a technique based on a linear incision on the face, extending from the labial commissure of the mouth to a virtual point in front of the year lobes. In combination to this approach, the authors describe a “U-shaped” incision, extending from the left to the right mandible angle, which enables the visualization of the lingual surfaces of the teeth. In the same way, in 1997, Ferreira et al.¹¹ present a technique based on two horizontal parallel incisions on the face. The upper incision extends from tragus to tragus, at the level of the anterior nasal spine. The lower incision extends from the right posterior border of the mandible to the opposite side, at the level of the mental protuberance. Further, in 2009, Silver and Souvion¹² describe another technique by performing a horizontal incision, from the commissure of the lips to the tragus, bilaterally, including a vertical incision in the midline of the upper and lower lips. As observed in the previous techniques, flaps of soft tissue are obtained, allowing for the vestibular and buccal visualization of the teeth as well as the jaw resections. Oppositely, into a more conservative scope, Nossintchouk et al.¹³ describe a technique in which a single V-shaped incision is performed on the hyoid bone level extending upward behind both ears, creating an extensive flap, exposing maxilla and mandible and preserving the victim's facial traits. Yet, the present technique combines more conservative incisions, placed in a less visible area if compared to other techniques,^{10–12} with dissections of masticatory muscles, avoiding the mandibular clenching by muscle stiffness. In addition, mandibular bone resection is performed at the level of the mandible angle in order to disarticulate the mandible body, facilitating the manipulation for mouth opening. In this context, the present technique comprehends an option for detailed intraoral examinations in the absence of imaging devices, allowing for the registration of visual

and photographic PM findings, as well as video recording with intraoral cameras.

5. Conclusion

The proposed technique combines conservative incisions with systematic muscle dissection and bone resection in order to provide an easy and fast-performing approach, which especially preserves facial traits without severe mutilation. Specifically, the technique is indicated for the presence of *rigor mortis* and in cases of intraoral firearm injuries.

Ethical approval

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None.

Conflict of interest

None declared.

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